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Baylor
College of
Medicine
GIVING LIFE TO POSSIBLE

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CFLSW Wing Surgeon

Disclosure

- Nothing to disclose – no financial conflict of interest
- Statements are authors' alone and are not endorsed by the command, university, Veteran's Affairs, or any other agency / organization
- The decision to listen to anything the speaker has to say is totally your own, and no one in the room has a weapon directed towards anyone in the audience.

Fleet Logistics Support Wing- Fort Worth

MISSION: The **Fleet Logistics Support Wing** is established to operate Navy Unique Fleet Essential Airlift aircraft on a worldwide basis to provide **responsive, flexible, and rapid deployable air logistics support required to sustain combat operations at sea**. During peacetime, squadrons provide air logistics support for all Navy commands as well as provide continuous quality training for mobilization readiness. Their **14 units use C-40As, C-9s, C-20A/Ds, C-130Ts and C-37A/Bs**. Their capacity to send equipment and personnel around the world using medium and heavy airlift on short notice is unparalleled in the United States military. The CFLSW staff is specifically tasked to provide administrative, personnel, and training support to 15 assigned squadrons. A comprehensive quality visit program has been implemented to maintain standardization and maximum readiness support for subordinate units.

HISTORY: Fleet Logistics Support Wing was commissioned in 1974 at Naval Support Activity, New Orleans, Louisiana as Reserve Tactical Support Wing. In 1983, the name was changed, and in 1986, the Wing Staff moved to Naval Air Station Dallas, Texas. In 1997, the staff again relocated to its current location at Naval Air Station Joint Reserve Base Fort Worth, Texas. Currently the **Airwing consists of 14 VR squadrons: one C-9 squadron, five C-130T squadron, one C-20G squadron, four C-40 squadrons and three C-37A Executive Transport Detachments.** Fleet Logistics Support Wing has no counterpart in the active force**. Its mission represents 100 percent of the Navy's intra-theater air logistics capability. The VR mission extends around the globe to Europe, the Western Pacific, Southwest Asia, South America, the Mediterranean, and Africa.** Fleet Logistics Support Wing continues to play an active and vital role in making the Navy a responsible and mobile arm of the Nation's defense.

Aeromedical Top 10+1 #4- Vibration- Induced Cervical Spine and Back Pain

CAPT Jeff Jones, MC, USNR, BCM, MEDVAMC; Rick Scheuring- NASA/JSC, US Army, Dan Buckland- MIT, Rogge Zheng, Boston Univ; Brian Snyder, MD, Harvard Univ., David Baskins, MD Methodist Houston Hospital Neurosurgery, LTC Dan Johnston, MD US Army; Raahul Ramakrishnan-BCM

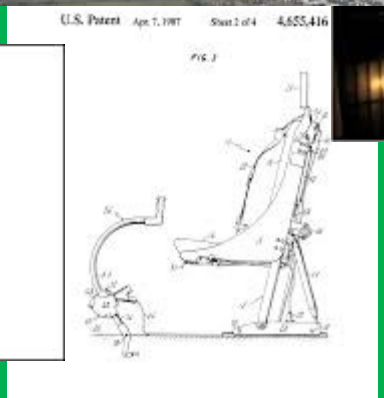
ments: D Monty

Etiology of Spinal Injury in Military Aviation

- Impact with terrain
  - CFIT- often fatal (skull-brain, thoracic organ injury- COD 272 MHs)
  - Autorotation- commonly produces spinal fractures
  - Hard landing- occasional spinal fractures
- Ejection-associated
  - Rapid loading event when pyrotechnics activate
- G-loading
  - HPJA with Helmet +/- NVG- acute or chronic sxs

Aviation Issues with Hard Landings

- Contact Injuries
  - Cockpit protection envelope
  - Survivability zone
- Decelerative Force Injuries
  - Seat Stroke
  - Flexibility
  - Soft tissue suppo



Aviation Issues with Hard Landings

- Contact Injuries (structural deformation)
  - Cockpit protection envelope
  - Survivability zone

Cockpit design
CABS- (Air Bag Sys)

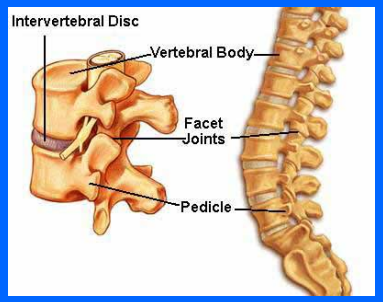
- Decelerative Force Injuries
  - Touchdown vector, attitude/pitch
  - Impact posture in seat; restraints
  - Skids, Seat Stroke
  - Flexibility

Seat design

Exercise Countermeasures

G-loading at various Cervical spine axes / angles / positions

Generic and Av Situation- G-loading and C-spine



- 10% of North Americans (30M) experience neck pain
- Due to high G forces, helmet loads and constant fatigue, Fighter Pilots are at a greater risk of developing chronic neck problems
- During hard turns- compress disc-get nerve root irritation due to bony contact “burner”
- Estimates are that >80% fighter pilots suffer cervical pain, paresthesias and other sxs.
- The VA reports that a high percentage of

Generic & Av Situation-Flight Vibration/ Spinal Issues

1) Back pain is 5th most common reason for MD visit, 2nd most for absenteeism, $75-100 billion/year estimated cost impact due to back pain in U.S. alone [33]
2) Prevalence in aviators- 82-92%; pain during flight- 44-50% [33]
3) Prolonged exposure to Whole Body Vibration induced physiological effects, including musculoskeletal disorders
4) Incidence of low back pain, degenerative osteoarthritis, disc changes, and herniated nucleus pulposus in spines are higher in employees with jobs involving WBV exposure than those without WBV exposure
5) Helicopter (Rotary Wing) pilots are exposed to higher WBV levels than Fixed-Wing pilots. Numerous studies have observed lower back and neck pain in helicopter pilots
6) Degenerative changes in the cervical spine were significantly more prevalent in the helicopter pilots compared with control group. In the cervical spine multivariate model, accumulated flight hours (per 100 hours) was associated with degenerative changes. And in the lumbar spine multivariate model, accumulated flight hours (per 100 hours) and age were associated with degenerative changes. Conclusion Accumulated flight hours were associated with degenerative changes of the cervical and lumbar spines in helicopter pilots

Differences in spinal symptoms in aviators vs non-aviators [25]

Variable	**Exposed group (n=164)**	**Control group (n=88)**
Age (yr)	34.9±5.12	39.6±6.36
20—29	31 (18.9)	3 (3.4)
30—39	105 (64.0)	38 (43.2)
40—49	28 (17.1)	47 (53.4)
Service length (yr)		
<10	79 (48.2)	35 (39.8)
≥10	85 (51.8)	53 (60.2) Accumulated flight hours 1,409.8±1,112.98
Daytime flight hours	2.5±0.89	
Cumul flight frequency	824.4±1,078.75	
Deg Δ in cervical spine	**68 (41.5)**	**16 (18.2)**
Deg Δ in lumbar spine	46 (28.0)	23 (26.1)

	Cervical	**Lumbar**
Service(yr) <10 vs ≥10	OR- 2.66 (1.52—4.64)	OR- 7.77 (3.74-16.14)

Spinal Health and Flying

Flying Against the Odds - Spinal Health Critical to Productive Career -Dr. Emily Roback ar
Helicopters' staff

Military pilots are particularly susceptible to back problems over the course of their careers.

Dr. Roback- aviation chiropractor with Alberta sports rehabilitation firm Chiroback Trekker- 17 year cumulative case study focused on seat and spine position, spine hydration and back stabilization in aviators.

She presented to Canadian Air Force helicopter pilots at the end of a spinal health seminar at 408 Helicopter Squadron, Edmonton-Garrison Military Base.

Approximately **90 per cent of the pilots in the audience reported experiencing back pain, with the remainder claiming to have suffered back issues in the past.**

Being a Helicopter pilot means risk of neck and back injuries due to poor posture and helicopter vibration. Helicopter pilots from various backgrounds – however well-intentioned – often succumb to these injuries and are not able to operate at their optimum level.

Research confirms that helicopter vibrations can seriously damage the discs in a pilot's back.

1994 report by R. Greth of the U.S. Army Aviation and Troop Command, "**helicopter hunch"** is one such condition that may inflict pilots. This condition is generally caused by poor posture during flight. It occurs when the spine is bent forward and is a contributing factor in the back pain diagnosis of a pilot. The need to ensure the stability and operation of the aircraft's cyclic control is the primary reason the pilot in this study maintained this particular posture. By sitting with the body hunched forward, pilots are able to bring their arms closer to the dashboard to maneuver the controls more efficiently.

Unfortunately, this **slouch position is further exacerbated as pilots use their right thigh as an armrest to support and stabilize the forearm. Since the elbow rest position is three to five inches above the thigh, pilots must lean forward and slightly to the right, to make contact.** At the same time, they need to tilt their torso to the left to be able to look out the side window. This asymmetric hunching has resulted in a "**hunched-back"**

Spinal Health (cont.)

A Vibration Across the Industry

Research has shown that helicopter vibrations (pressure waves caused by imbalances in rotating aircraft parts) have a peak power frequency of approximately 5 Hz - within the range where a human's upper body presents resonance frequency (De Oliveira, Nadal).

Other researchers have studied whole body vibration and the pathogenesis of disc degeneration in animals. The results have suggested that vibration can adversely affect the nutrition and metabolism of the disc, especially if the vibration matches the resonant frequency of the spine (4-6 Hz). With this in mind, people exposed to whole-body vibration in the same resonant range, such as helicopter pilots, are significantly more prone to experiencing back pain.

Further, according to a 2008 report on the pathophysiology of disc degeneration (A.G. Hadjipavlou), when the spine is flexed, the joints offer less constraint to rotation, a situation that leads to tears in the discs, yet does not damage to the joints.

Per Hadjipavlou, the intervertebral discs (spine shock absorbers) are the largest avascular tissues in the body, which suggests the conclusion that cells in the center of an adult thoracic disc are approximately 8 mm away from the nearest supply of blood. The cells that are located on the outer edges of the disc obtain nutrients from large blood vessels in the surrounding muscles and from a sparse diffusion of capillaries (tiny blood vessels) in the muscle's outermost region. The capillary network is regulated by noradrenalin and acetylcholine (vessel constrictors and dilators), and by mechanical stimuli such as vibration. Each disc relies on a distribution system to pump water and nutrients into the disc. According to some researchers, **sustained compression** or an immobilization of the spine can become a base for impairing the flow of nutrition to the disc. **The reduced supply of nutrients** leads to an increase in stress and cell death at the center of the disc, and eventually spreads throughout the entire disc with increased age and degeneration.

J Sandover's (U. Technology Loughborough, England) 1981 report on the effects of vibration, posture and low-back disorders of professional drivers, reviewed the relationship between mechanical stress on the spine and intervertebral disc degeneration, considered to be the most likely cause of the back pain. Sandover's findings disclosed that **mechanical stress hastens**

Spinal Health (cont.)

However, the most common malformations and/or diseases in general population are disc degeneration (also known as spinal osteoarthritis) and disc herniation (slipped disc). It is normal for the discs between the vertebrae to deteriorate with age. Herniation of a disc may be the result of degeneration accompanied by severe loading. The herniated disc can bulge or rupture into the spinal canal through the back end of the spine. This bulge can subsequently entrap the nerves of the upper and/or lower body, causing intense pain in the area served by the nerves, paralysis, or a parenthesis – a tingling, or "pins and needles" sensation.

D. Harrison of the Journal of Manipulative & Physiological Therapeutics, studied the optimal driver's seat and spine position and established that **piloting a helicopter predisposes a flight operator to mid-back pain and a degenerative joint disease (spinal osteoarthritis**). In spinal osteoarthritis, it has been reported that there is an accelerated and increased level of deterioration (especially in workers in the 45-50 age range) and the prevalence of this condition normally increases with age. The cumulative effects and repetitive loading of the spine due to an awkward body posture (static work, bending, and twisting), and whole-body vibration, does in fact contribute to expediting the degeneration and general fatigue failure of the spine.

Chiropractors can be invaluable in the education, treatment and prevention of such injuries.

Roback concludes that the duties of a helicopter pilot actually accelerate and amplify the level of spinal degeneration, originating primarily in the thoracic and low-back region. The signs and symptoms of osteoarthritis due to **induced vibration and postural stresses appear to be directly related to both back pain and the unique after-effects of having flown helicopters.** Furthermore, the helicopter pilot in this case study appeared not to have made any significant improvement while participating in his physiotherapy treatments in 2002 at a local base hospital. Although the physiotherapy program was extensive, it would be difficult to ascertain whether or not if it would be therapeutically beneficial.

With this in mind, this **veteran pilot would be an excellent candidate for an integrative health-care program – a platform that would incorporate postural exercises, nutrition, chiropractic, massage therapy, acupuncture, and aircraft**

Spinal Health (cont.)

Pilot flight positioning of the pilot's form, the spine was identified as being near an extreme point of the body's range of motion; therefore, the ligaments and discs were more prone to injury. The pilot's back muscles became fatigued by experiencing stress in a constrained posture, and the pilot was less able to protect his spine against the effects of vibration.

Repeated or persistent loading (vibrations) of the joints was suspect in causing inflammation or degeneration of the affected joints.

Another important factor to consider is dehydration. Lack of water intake may predispose a pilot to back problems at high altitudes.

Dehydration tends to lower blood pressure which in turn leads to a decrease in 'G' tolerance. The combination of high cockpit altitudes and breathing in what could be extremely dry oxygen can lead to additional water loss in flight.

Moreover, spine instability is a condition in which the bones positioned in the back are unable to remain in their proper setting while the body is in motion. **Prolonged, unsupported sitting will lead to reduced flexibility in the lower back and hip joints. Pilots who do not stretch and improve their core muscle endurance and/or strength usually find themselves shifting their bodies to minimize discomfort while seated.**

Flying Upstream

Roback maintains it is a misconception for helicopter pilots to assume they have a healthy spine. Her advice is simple – have your back checked over by an aviation chiropractor and a medical doctor. Practice good flight posture, exercise proper flying techniques and drink **two liters of water daily**. Also, consider using a cushion as it can dampen the long-term, negative after-effects of in-flight vibrations.

Pilot health is of paramount importance to the safe operation of all flights. Both to the pilots themselves, for obvious reasons, and to the military, as pilots are the most expensive part of the helicopter. Basic training for helicopter pilots should address the risks associated with posture and vibration. Without the proper funding for integrative health care for our active pilots, we will be

Cervical Spine Hazard from Ejections

Nav Air Systems Command
Pax River; Criterion Analysis Incorporated; P Whitley

A data extraction from the current Navy Safety Center Database between 1994 and 2004 shows there were 168 ejections. Of those ejections, 52 had some degree of cervical spine injury. Of 52 injuries, 9 spinal cord, 9 multiple site and 2 unknown location injuries were recorded. The remaining 32 injuries across C1-7 (1994-2004) are in the table with number, percentage of remaining & estimated AIS severity. An AIS level was estimated based solely on general classifications. AIS % table is a summary of the percentage of estimated AIS levels across the injuries from C1-7 1994-2004 table.

C1-7 Ejection Injuries (1994-2004)

Injury Type	Number	Percentage	Estimated AIS
Abrasion	1	3%	1
Decapitation	4	13%	6
Dislocation	2	6%	2
Fracture	14	44%	2
Fracture w/ dislocation	1	3%	2-3
Fracture, Compound and Comminuted	2	6%	3
Fracture, Compound	6	19%	2-3
Fracture, Compression	1	3%	2-3
Sprain	1	3%	1

AIS Percentages for Naval Ejection Cervical Spine Injuries

Estimated AIS	Percentage
1	6%
2	50%
2-3	25%
3	6%
6	13%

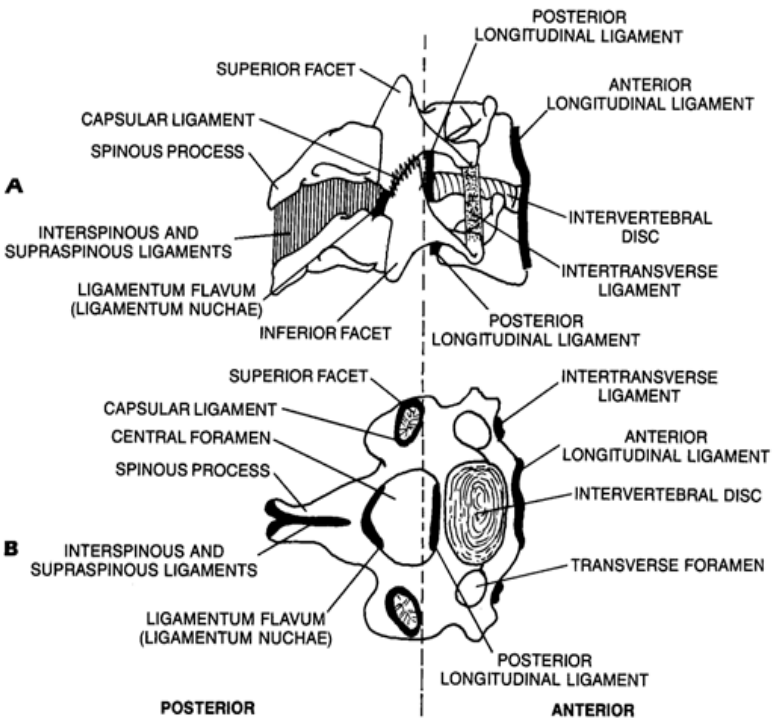
	Severe	
	Severe	
	Severe	
	Severe	
	Severe	

Highest Severity Ejection Neck Injury Classifications

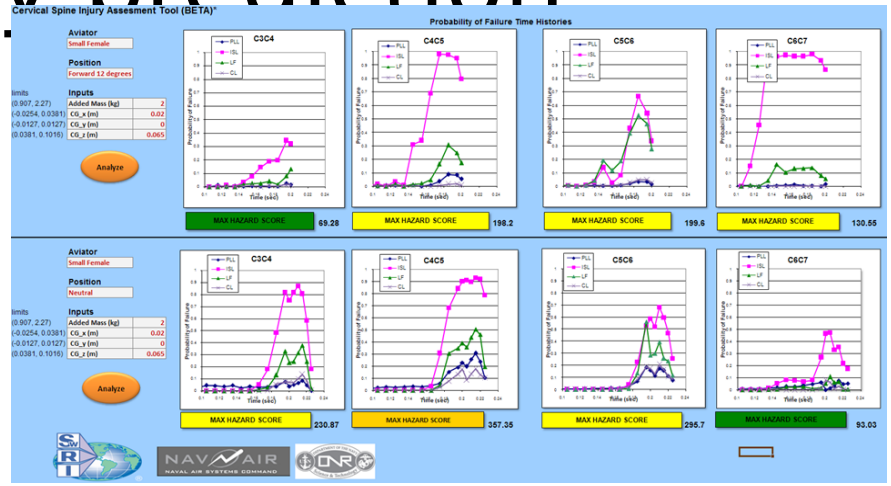
	12	
	6	
	5	
	4	

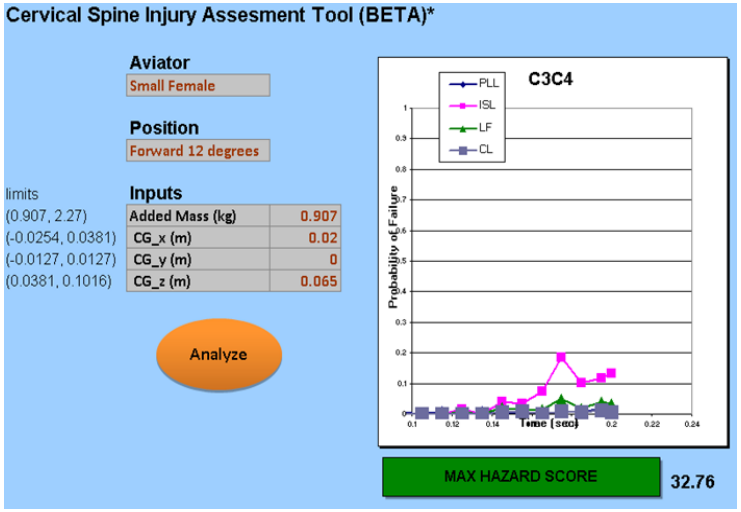
Guill Injuries and Classifications compared to

Key anatomical locations for cervical spinal injury and tool for c-spine injury prediction



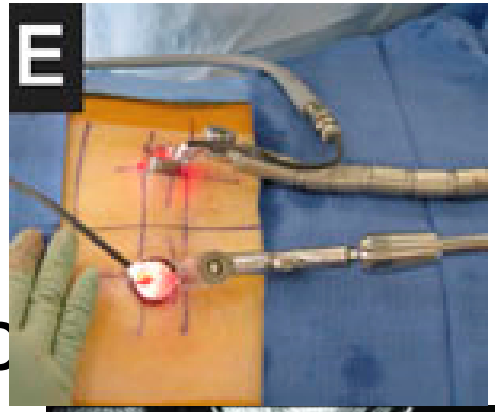
Cervical Spine Functional Spinal Unit (FSU)

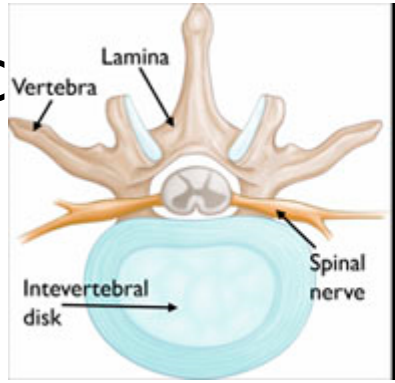


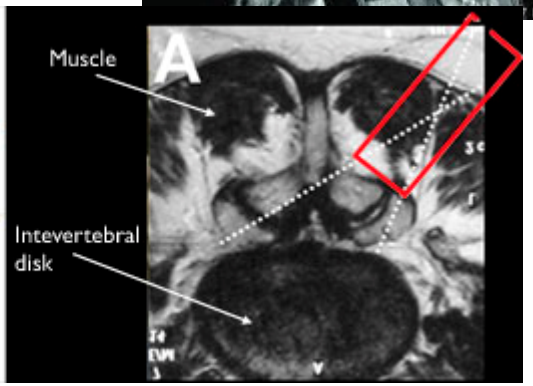


Therapeutic approaches: Operative

- Extraction of fragments
- Minimally Invasive laminecto
- Microdiskectomy
- Laminectomy
- Spinal fusion
  - Anterior approach
  - Posterior approac
  - Combined



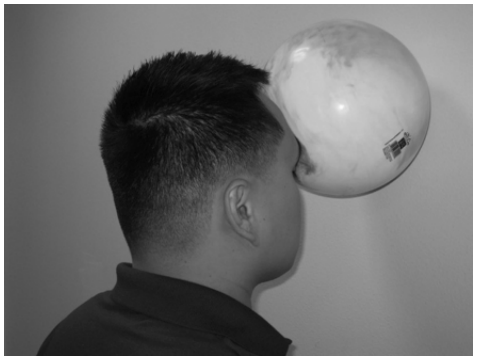




Therapeutic approaches: Operative

- While a chance to cut is a chance to cure,
  - A trip to the OR is Late in the game
  - Occurs after significant degenerative disease and/ or instability
- Should intervene earlier
  - Prophylaxis / Preventative measures

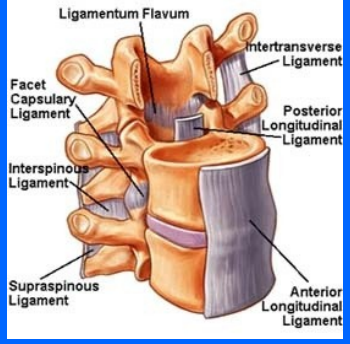
Therapeutic approaches: Conservative measures-



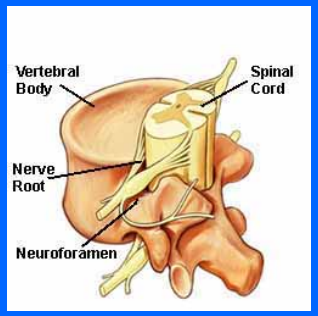
Conservative management of uncomplicated mechanical neck pain in a military aviator (JCCA 2010; 54(2):92–99)

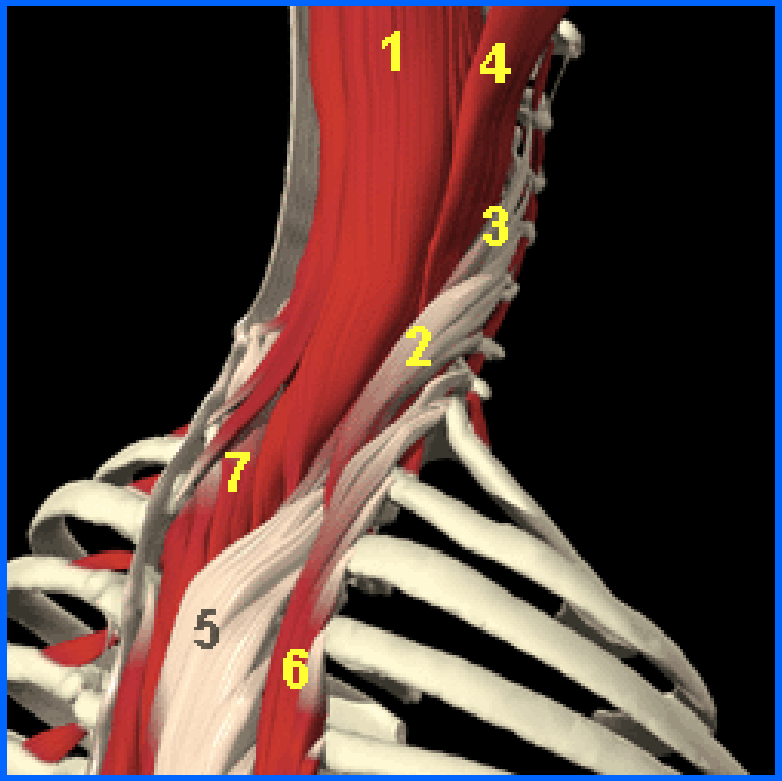
Non-radicular neck pain arising from local musculoskeletal structures, known as mechanical neck pain or somatic dysfunction, is highly prevalent in the fighter jet aviator population. The management of this problem includes both **therapeutic and aeromedical decisions. In addition to non-steroidal anti-inflammatory medications, the waiver guides recommend therapeutic exercise and manipulative therapy as treatments for somatic spine pain in aviators, and such treatments are employed in many military locations.**

However, there are currently no published studies that describe the use of **manipulative therapy for fighter jet aviators**. We report the case of an F/A-18 instructor pilot who experienced long-term relief of uncomplicated mechanical neck pain following interdisciplinary management that included manipulation and a home



Relevant Anatomy





So you need to provide better structural support of your neck- strengthen the muscles!

Muscles of the Posterior Cervical and Upper Thoracic Spine

1. Semispinalis Capitus (head rotation/pulls backward)
2. Iliocostalis Cervicis (extends cervical vertebrae)
3. Longissimus Cervicus (extends cervical vertebrae)
4. Longissimus Capitus (head rotation/pulls backward)
5. Longissimus Thoracis (extension/lateral flexion vertebral column, rib rotation)
6. Iliocostalis Thoracis (extension/lateral flexion vertebral column, rib rotation)
7. Semispinalis Thoracis (extends/rotates vertebral

CERVICAL MUSCLES	FUNCTION	NERVE
Sternocleidomastoid	Extends & rotates head, flexes vertebral column	C2, C3
Scalenus	Flexes & rotates neck	Lower cervical
Spinalis Cervicis	Extends & rotates head	Middle/lower cervical
Spinalis Capitus	Extends & rotates head	Middle/lower cervical
Semispinalis Cervicis	Extends & rotates vertebral column	Middle/lower cervical
Semispinalis Capitus	Rotates head & pulls backward	C1 – C5
Splenius Cervicis	Extends vertebral column	Middle/lower cervical
Longus Colli Cervicis	Flexes cervical vertebrae	C2 – C7
Longus Capitus	Flexes head	C1 – C3
Rectus Capitus Anterior	Flexes head	C2, C3
Rectus Capitus Lateralis	Bends head laterally	C2, C3
Iliocostalis Cervicis	Extends cervical vertebrae	Middle/lower cervical
Longissimus Cervicis	Extends cervical vertebrae	Middle/lower cervical
Longissimus Capitus	Rotates head & pulls backward	Middle/lower cervical
Rectus Capitus Posterior Minor	Extends head	Suboccipital
Obliquus Capitus Inferior	Rotates atlas	Suboccipital
Obliquus Capitus Superior	Extends & bends head laterally	Suboccipital

Countermeasures Research
IRB approved
Cervical Musculoskeletal Training

Cervical Spine

Barry Shender (PAX River)

Phil Whitley

Traumatic Brain Injury

LTC Dan Johnston, US Army

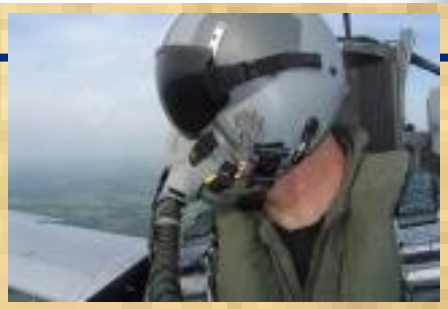
NECKX™
Restore your Mobility

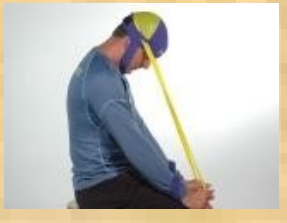
Xtra Performance thru Xtra Strength and Flexibility

DESCRIPTION: NeckX™ is a light weight, portable neck exercise device that stretches & strengthens neck musculature to increase flexibility & stamina, reduce the likelihood of injury, relieve pain & improve mission effectiveness.

VALUE TO NAVAL WARFIGHTER:

- Build neck musculature to prepare for the stresses of combat.
- An exercise device and system for targeting physiological components such as muscle groups, connective tissue and structural alignment of the neck and upper body.
- Therapy device for the rehabilitation of non-radicular cervical pain known as somatic dysfunction or mechanical neck pain.
- Improve mission effectiveness by allowing for full ROM of the neck.
- Employ in military pilot community, esp. fighter aircraft, to combat short & long term effects of high +Gz on C-spine.
- Use as a pre-flight warm-up routine to prepare for the rigor of flying in high +Gz sorties.
- Improve posture and cervical strength to deal with the increased weight of helmets & helmet mounted devices (i.e.-JHMCS, NVGs, HMDs etc.)
- Use to maintain full ROM and flexibility for visual capability, target acquisition, & comfort.
- Decrease the occurrences of acute and chronic neck pain suffered by almost 90% of fighter pilots over a career.
- Reduce the number & severity of VA claims related to cervical spine issues and thereby save USN medicine funds & improve long term QOL for retired pilots.





OBJECTIVES

VARIANTS

- The NeckX™ system consist of a fleece cap and safety wrist loops.
- Three levels of Exercise Bands are provided to facilitate increased resistance training. These bands are easily switched and can be fixated to target specific muscle groups.
- Recommended exercises are provided to target the cervical musculature most commonly related to neck muscle strain.

RECOMMENDATIONS

- Develop a research protocol to evaluate the effectiveness & safety of the device for the operational flying community
- Deploy into a select group of new and experienced

NECC

Adaptive, Responsive, Expeditionary

Study tools and procedures

Study Using Barry Shender's data collection form for aviation duty exposure or H. Wyman Mod

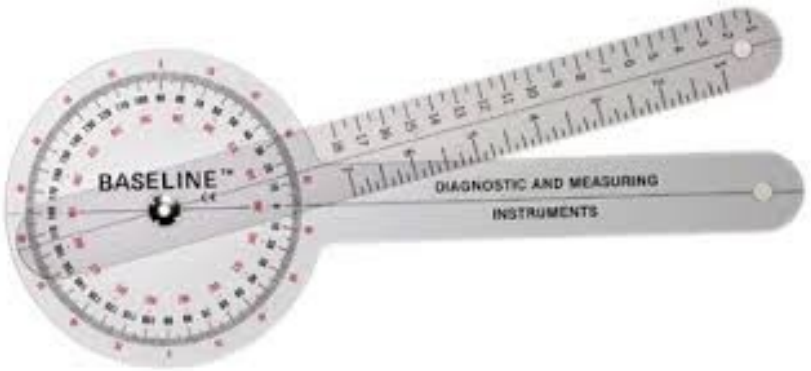
ROTARY WING AIRCRAFT

Helmet Designation	F/A-18	F-16	F-14	F-5	AV-8B	S3	E-2C	TE-2C	EA-6B	P-3	C-2	T-2	TA-4F, J	T-6	TA-7C	TAV-8B	T-25	T-34 B/C
HGU-55A/P (USAF helmet)	X																	
HGU-66(V)/1P (has NVG mount)																		
HGU-68(V)/P																		
HGU-68(V)1/P																		
HGU-68(V)2/P																		
HGU-68(V)3/P																		
HGU-68(V)4/P																		
HGU-68(V)6/P																		
HGU-85(V)/1P (has NVG mount)																		
HGU-87(V)/P22P-16 (Combat Edge)																		
HGU-89/P22P-16 (-85 w/Combat Edge)																		

FIXED WING AIRCRAFT

				(SAR)									& copilot	crew				
HGU-67/P																		
HGU-84/1P																		
HGU-84/2P																		
HGU-84/3P																		

Study tools and procedures



Data Collection Form

Aviator/Patient Name or Initials & last 4 _____

Date of (Initial) Pre-Assessment _____

Date of (Interim) Mid-Assessment _____

Date of (Final) Post-Assessment _____

Neck X Data Acquisition-

RANGE OF MOTION (with Medium Resistance Band)

Neck Rotary Range of Motion (0º-straight head; 90º- due left or right parallel to shoulder)

Pre	Degrees Left	_____	Degrees Right	_____
Mid	Degrees Left	_____	Degrees Right	_____
Post	Degrees Left	_____	Degrees Right	_____

Neck Lateral Bending Range of Motion (0º-vertical; 90º- laying on shoulder horizontal)

Pre	Degrees Left	_____	Degrees Right	_____
Mid	Degrees Left	_____	Degrees Right	_____
Post	Degrees Left	_____	Degrees Right	_____

Neck Flexion-Extension Range of Motion (-90º- touching back w head; +90º touching chest x chin)

Pre	Inches from Chest	_____	Inches from Back	_____
Mid	Inches from Chest	_____	Inches from Back	_____
Post	Inches from Chest	_____	Inches from Back	_____

ENDURANCE

Neck Rotary Endurance (with Medium Resistance band)

Pre	#of Reps:	Left	_____	Right	_____
Mid	#of Reps:	Left	_____	Right	_____
Post	#of Reps:	Left	_____	Right	_____

Neck Lateral Endurance (with Medium Resistance band)

Pre	#of Reps:	Left	_____	Right	_____
Mid	#of Reps:	Left	_____	Right	_____
Post	#of Reps:	Left	_____	Right	_____

Neck Flexion-Extension Endurance (with Medium Resistance band)

Pre	#of Reps:	Ext	_____	Flex	_____
Mid	#of Reps:	Ext	_____	Flex	_____
Post	#of Reps:	Ext	_____	Flex	_____

Post Neck X use Data Recording-

Record any side effects or adverse events:

Effect or Event _____

Date/Time of Event _____ / _____

Activity with Neck X immediately preceding the event _____

_____

_____

Duration of symptoms _____

Resolution of symptoms or other therapy- _____

_____

Record your impression, after using the Neck-X, of your NECK:

Flexibility:	Worse	Same	Slightly Improved	Vastly Improved
Strength:	Worse	Same	Slightly Improved	Vastly Improved
Stiffness:	Worse	Same	Slightly Improved	Vastly Improved
Pain:	Worse	Same	Slightly Improved	Vastly Improved

Record any comments- (e.g. your impression of the device and its use, do you think it can help you with regular use between or pre-flight, etc.) _____

_____

_____

_____

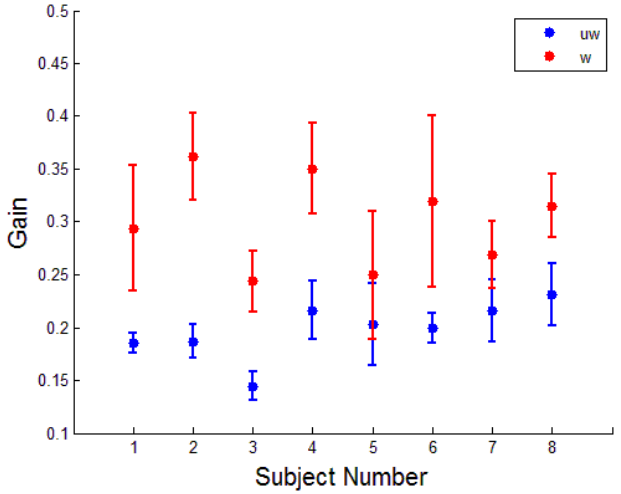
Cervical Stretching & Exercises

http://www.military.com/video/aircraft/jet-fighters/awesome-f-18-jet-fighter-footage/1331898407001/

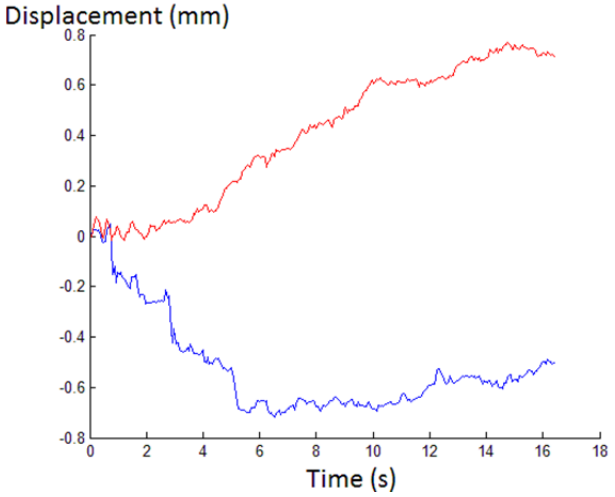
Collaboration with Harvard, MIT, Boston Univ, Baylor College of Medicine, Methodist Houston

Dan Buckland- MIT, Rogge Zheng- Boston Univ; Brian Snyder, MD- Harvard Univ., David Baskins, MD- Methodist Houston Hospital Neur

Impulse gain significantly increases with the addition of an Army helmet + weight (red) versus unweighted helmet (blue) ($p<0.001$)



C4-5 Displacment under Distraction and Loadings. Red: 20 lbs distraction Blue: 20 lbs compression. Values correlate with ex-vivo work with 20lbs producing about .6 mm of displacement.



Pilot Study Results with Cervical Countermeasure Device

Subjects: N= 10 F/A-18 Pilots

Protocol: 3 weeks x 2, bid use- progressively increasing resistance and number repetitions Measurements Pre and Post exercise regimen

Results:

	Flexion	Extension	Lat Bend	Rotation
Strength Measures	+ 8%	+11%	+13%	+10%
Endurance Measures	+ 9%	+12%	+10%	+17%
Flexibility Measures	+ 5%	0%	+ 7%	+ 8%

Fighter Pilot Testimonial

Thank you for your assistance in acquiring the NeckX. I am honoured to be the first international pilot customer! I am a fighter pilot in the Royal Australian Air Force and was looking for some neck exercises on the internet when I came across your website. I found it via google using a search of something like "fighter pilot neck exercises". In terms of being influenced to buy the product I thought your website was very professional, with good videos but for me the fact that it was designed and used by a fellow fighter pilot was probably the main factor.
I tried it out this afternoon and found it very good at working some of the neck muscles and movements that are normally quite hard to target. I'm sure it will be a useful training tool for flying with JHMCS and I will recommend it to the guys in the squadron.

Congratulations on your great idea and I hope it is a success for you.

Kind regards,

Anthony O.

Summary of Discussion

- Multiple causes of spinal disease in aviators
  - Impact, Ejection, G-loading, chronic vibration / posture
- Aeromedical principle – prevention of disease
- Focus on spinal health protection
  - Aircraft/cockpit factors
  - Seat / restraint factors
  - Education
  - Exercises
- Forward work- Interservice agency agreement

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